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Linking at-sea foraging behavior and breeding performance of black-legged kittiwakes nesting at colonies in different Bering Sea domains

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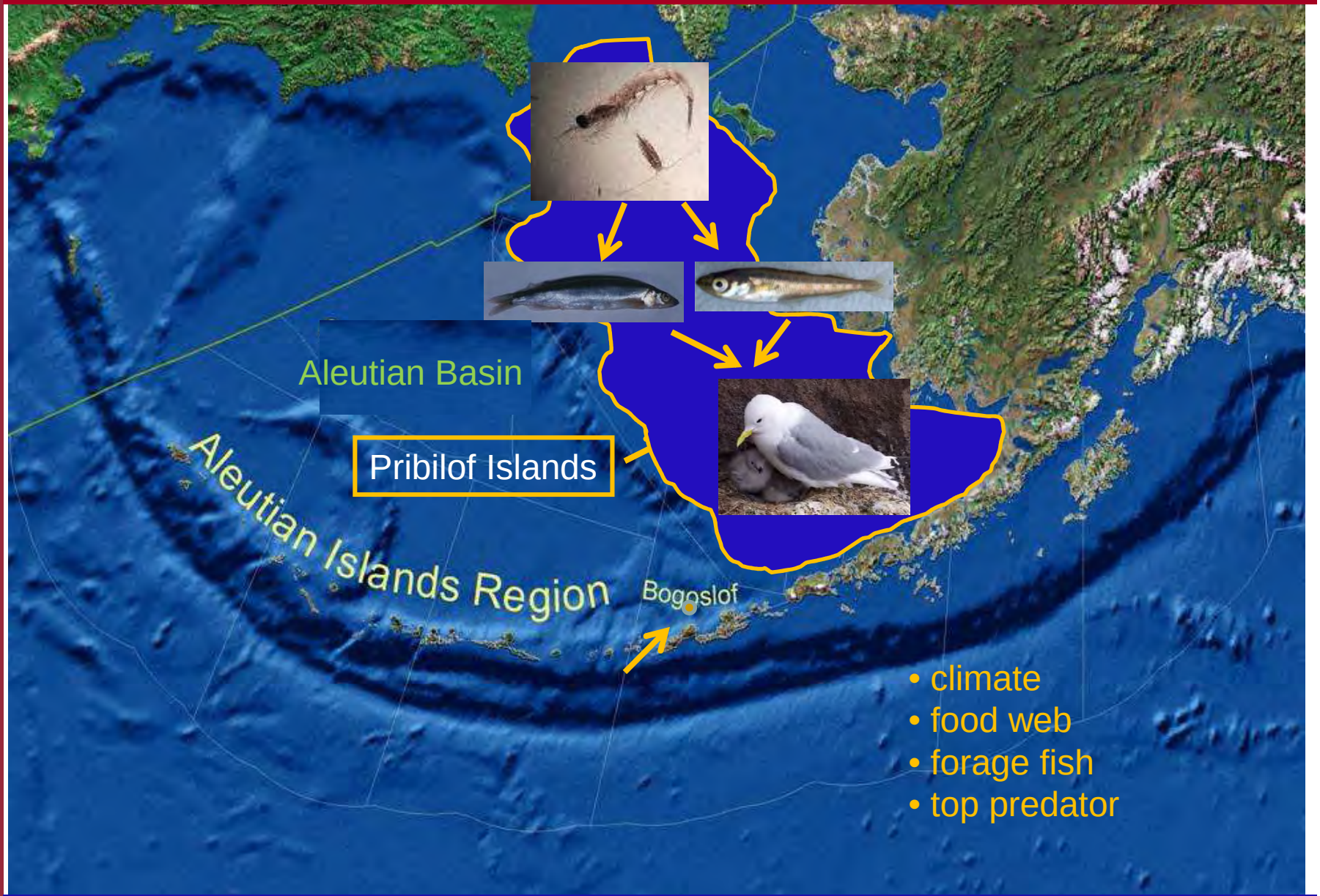
Assumptions

- At-sea distribution of seabirds will reflect predictable prey within commuting distance of breeding colonies

- Reproductive success will reflect the proximity of breeding colonies to predictable prey patches or hot spots

Southeastern Bering Sea Shelf – Pribilofs



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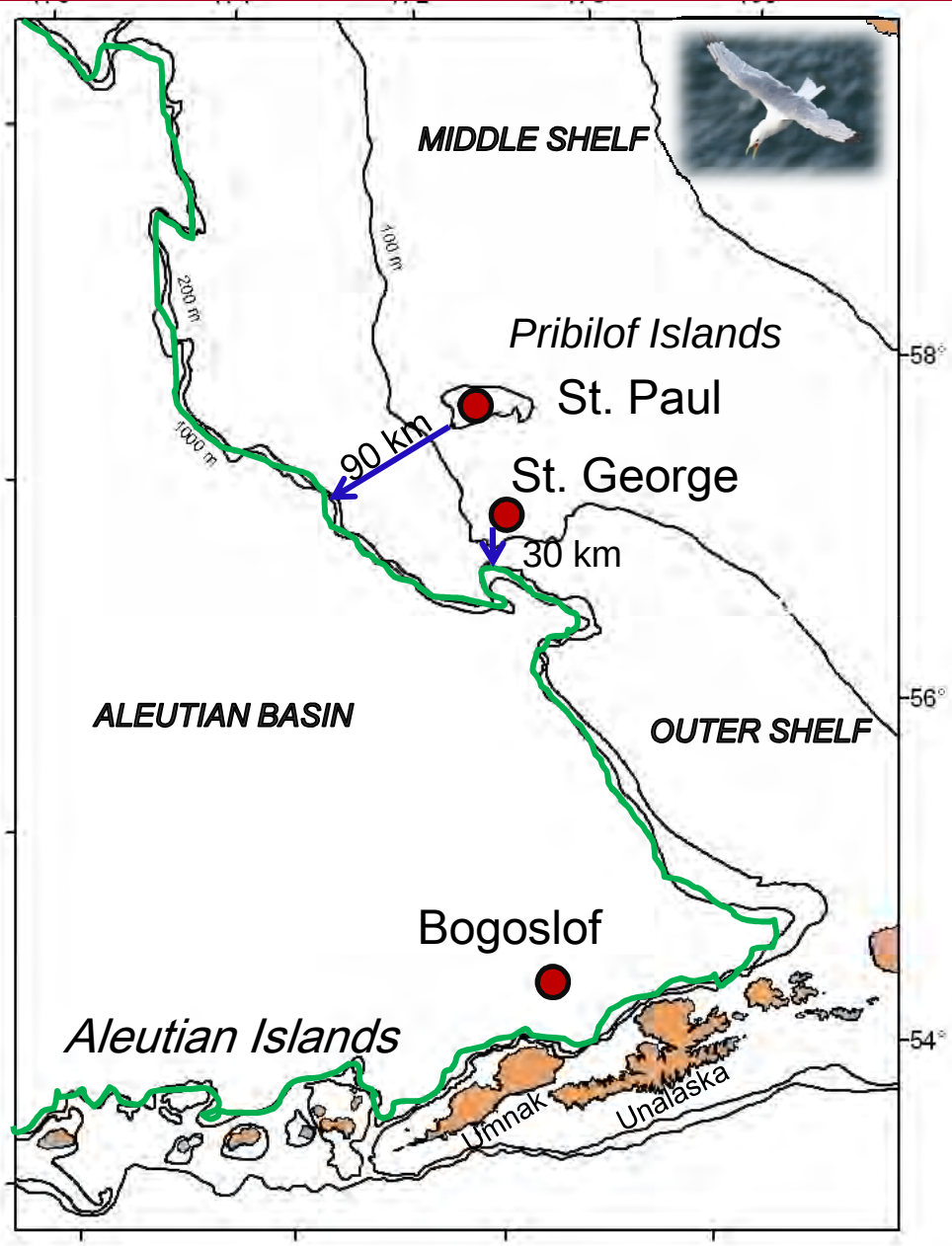
Hunt et al. 2011; Coyle et al. 2011

Difference in proximity to Shelf Break



Springer et al. 1996; Byrd et al. 2008

Contrasting top predator population trends

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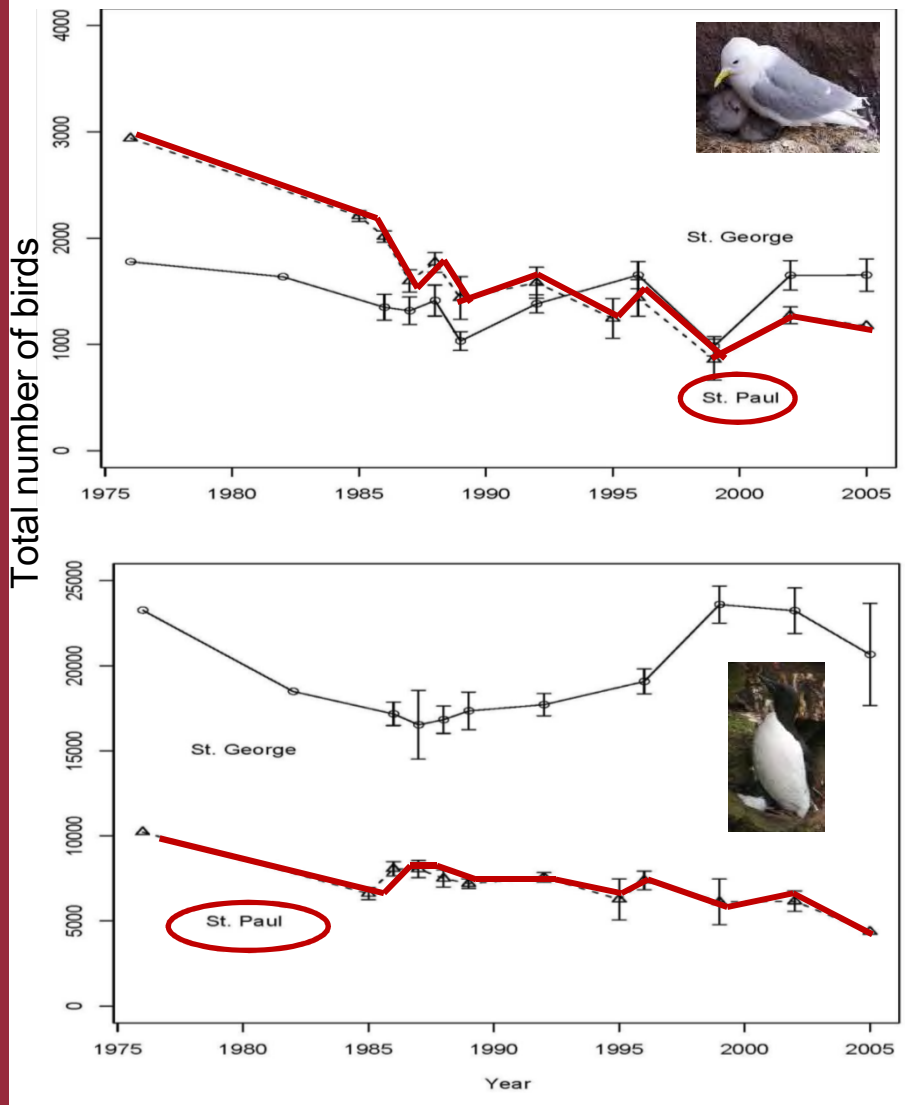
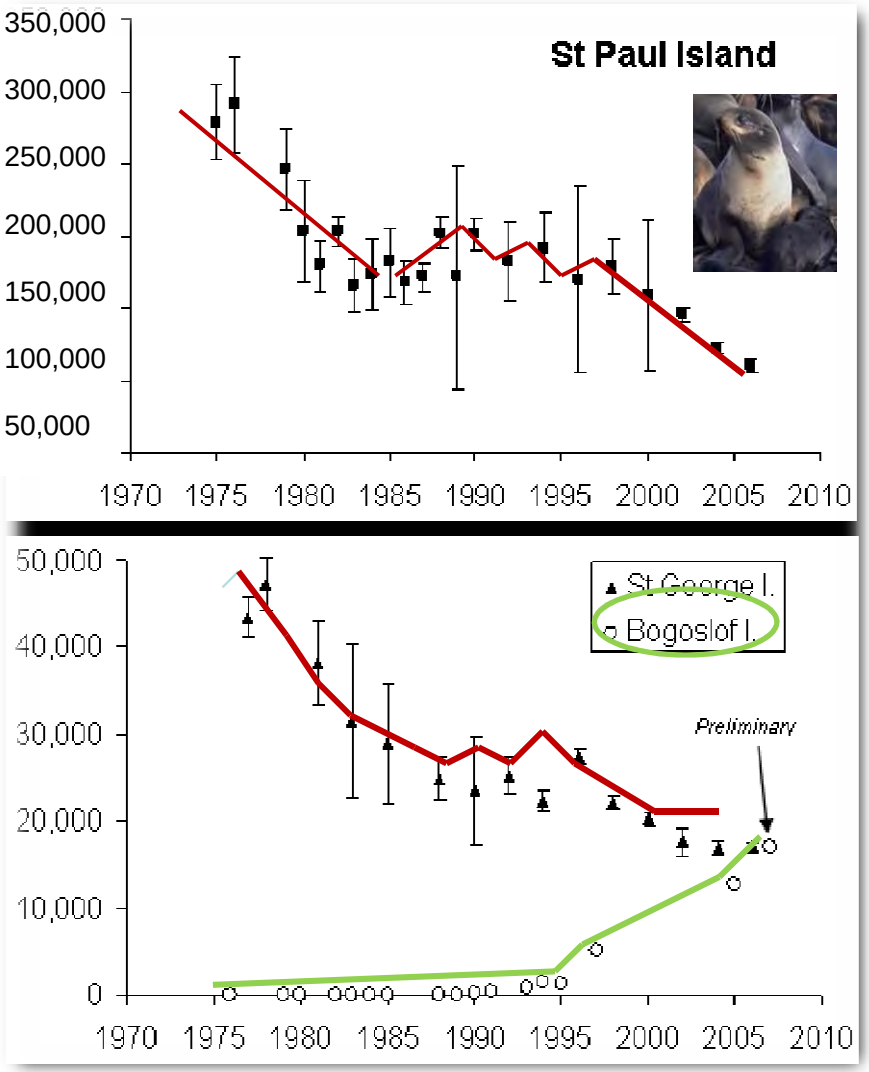
Seabirds



Northern fur seals



Byrd et al. 2008; Lowell Fritz, NMML Alaska Ecosystem Program

Objectives & Predictions

LOCATION MATTERS?

Compare at-sea foraging behavior, breeding performance, and diet of black-legged kittiwakes (*Rissa tridactyla*)

1) Spatial comparison– 2009: Pribilofs (shelf) vs. Bogoslof (basin)

Domain matters?

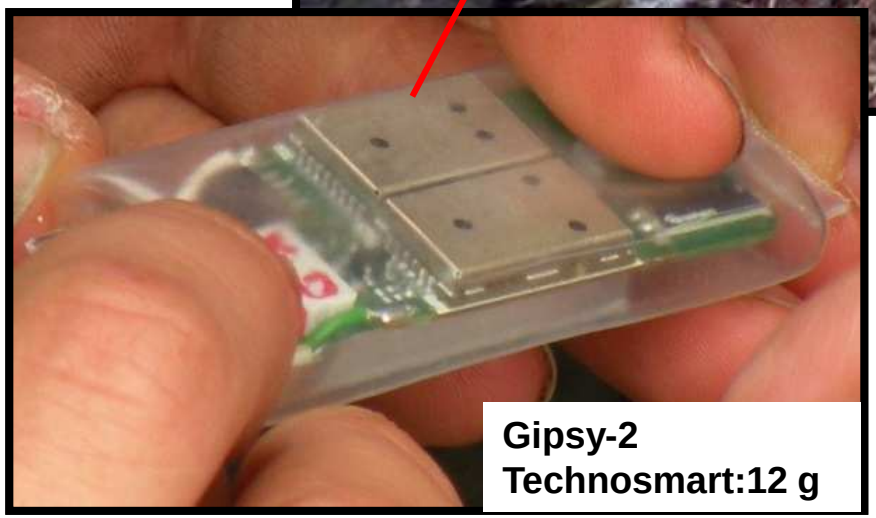
Prediction: Basin colony will do better than shelf colonies

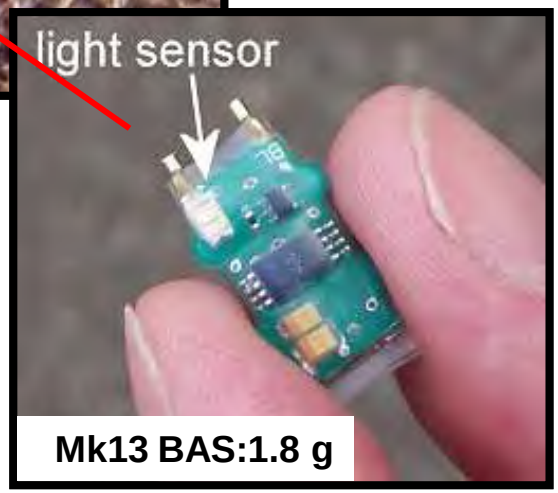
2) Temporal comparison – 2008 to 2010: Pribilofs

Proximity to Shelf Break matters?

Prediction: St. George will do better than St. Paul

GPS (location) & activity loggers (feeding behavior)





Methods: GPS Tracking

Results

Compare the at-sea foraging behavior, breeding performance, and diet of black-legged kittiwakes (*Rissa tridactyla*)

1) Spatial – 2009: Pribilofs (shelf) vs. Bogoslof (basin)

Domain matters?

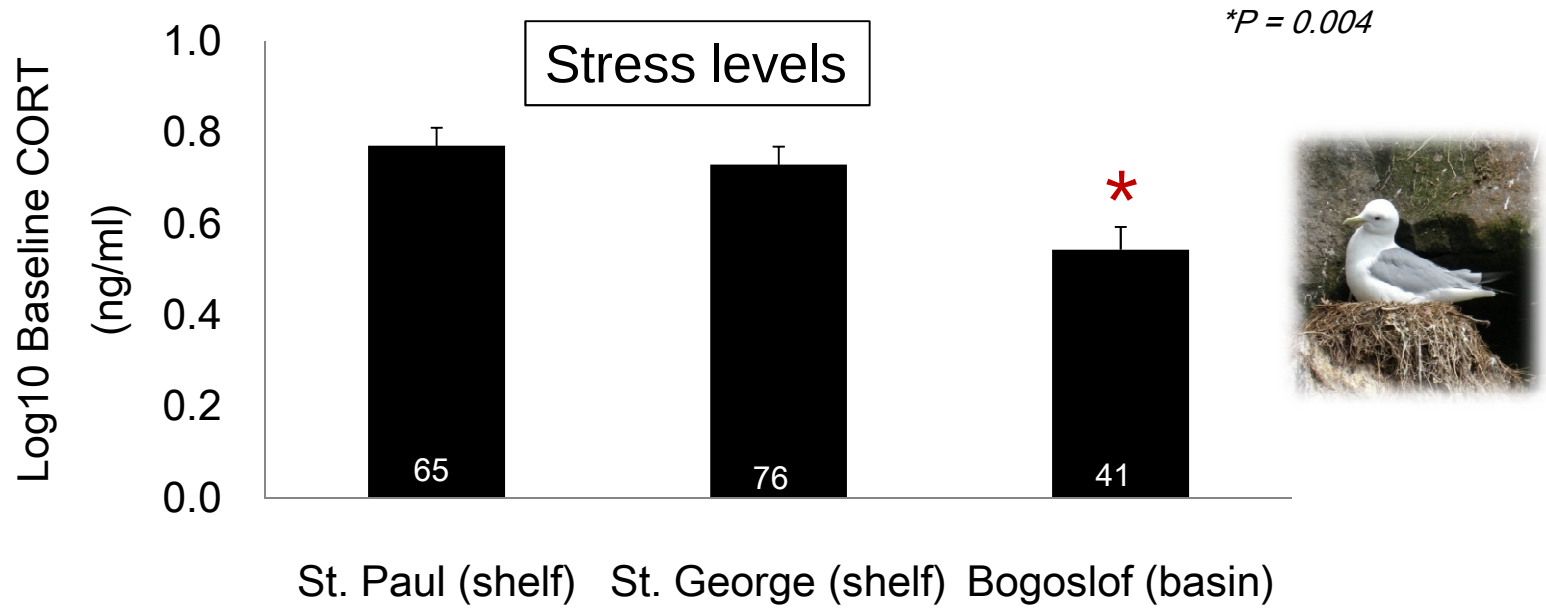
Prediction: Basin colony will do better than shelf colonies

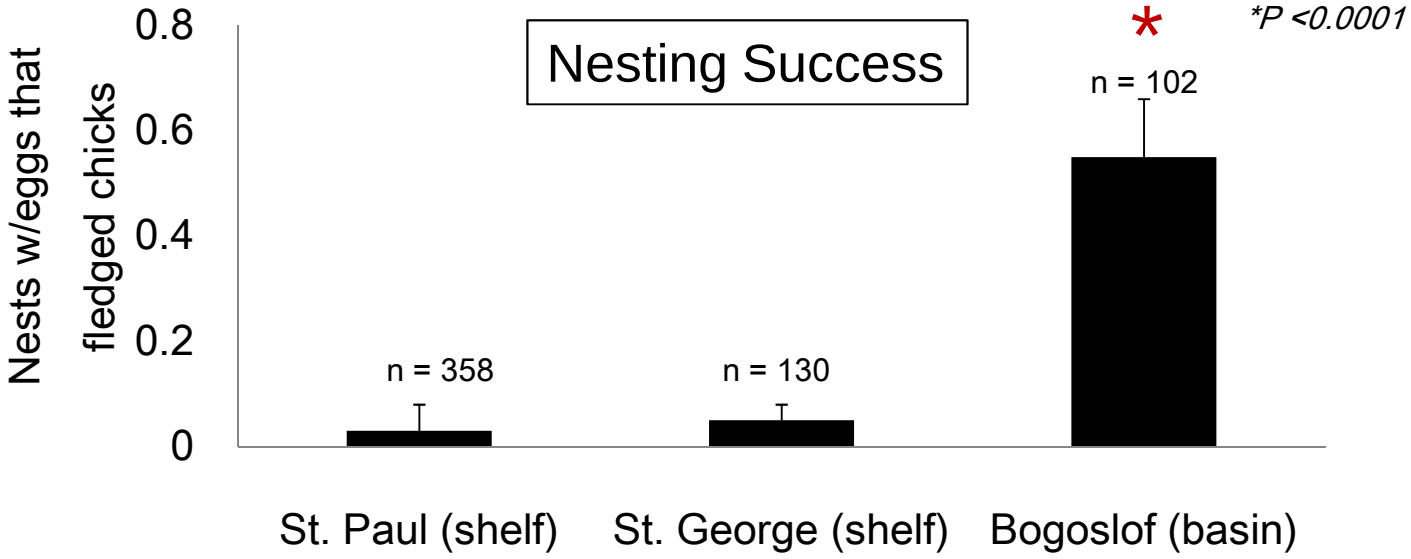
2) Temporal – 2008 to 2010: Pribilofs

Proximity to Shelf Break matters?

Prediction: St. George will do better than St. Paul

Higher food availability in basin than on shelf





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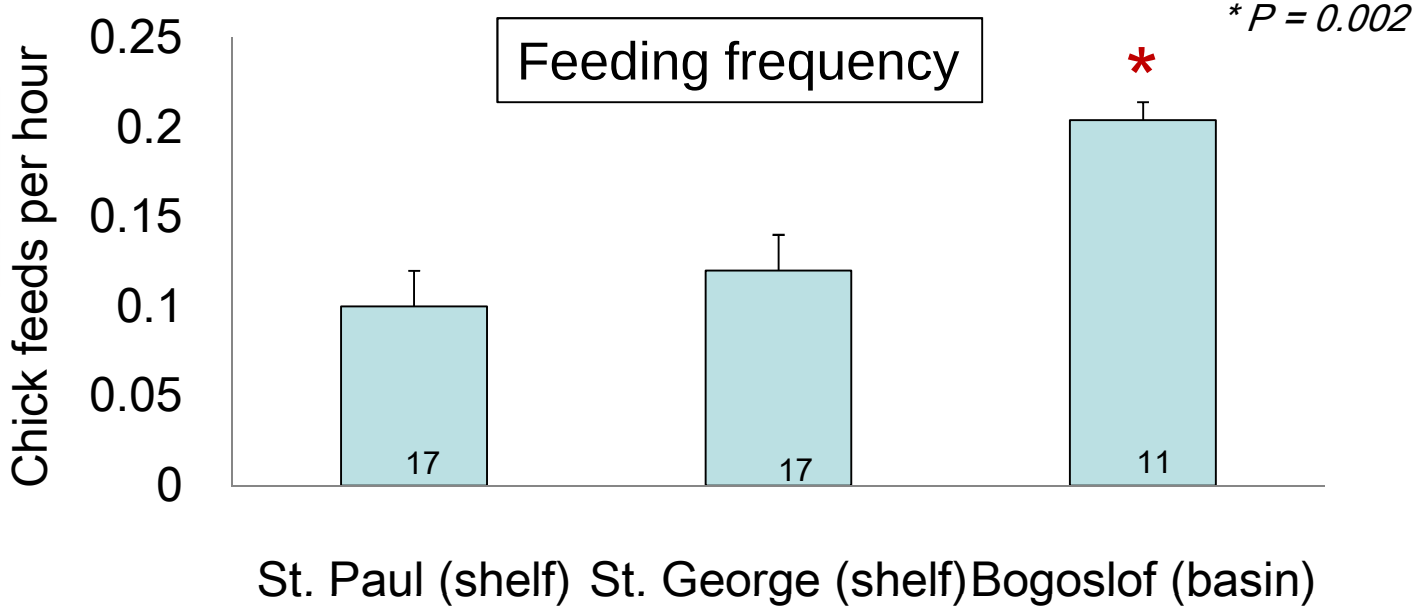
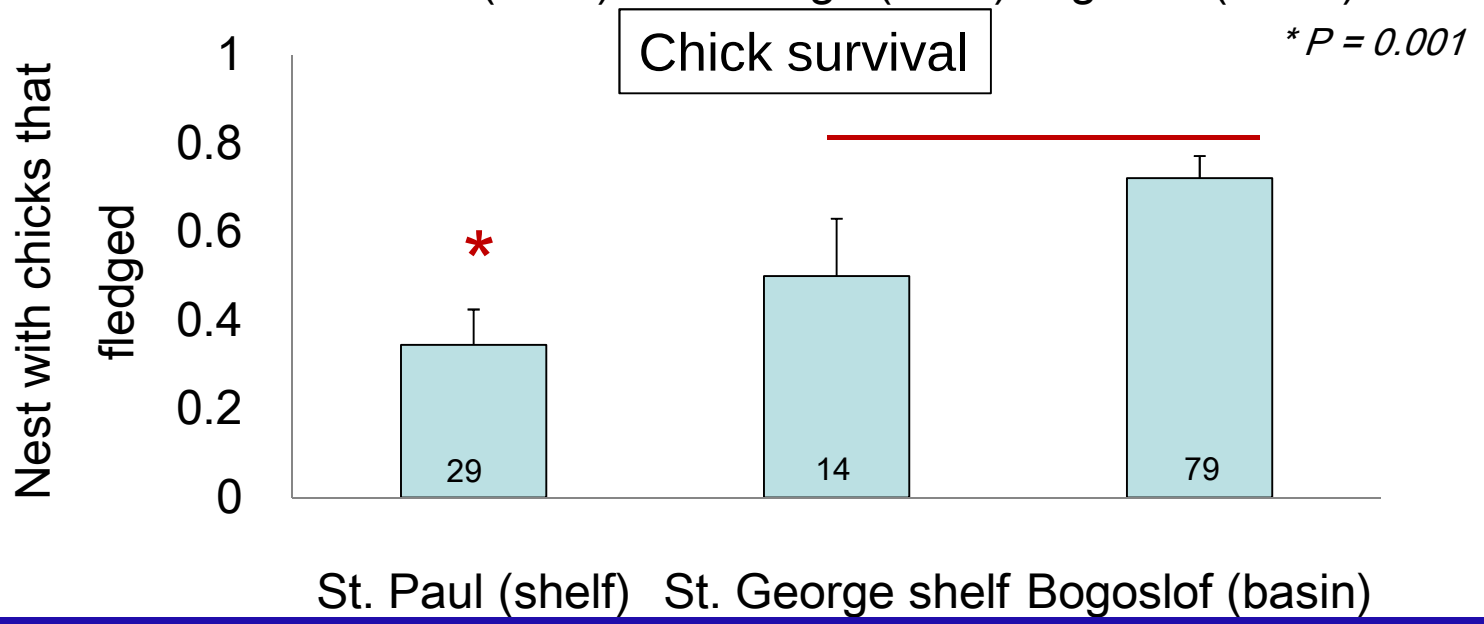
Spatial comparison results ***Breeding performance***

Higher breeding performance in basin than on shelf





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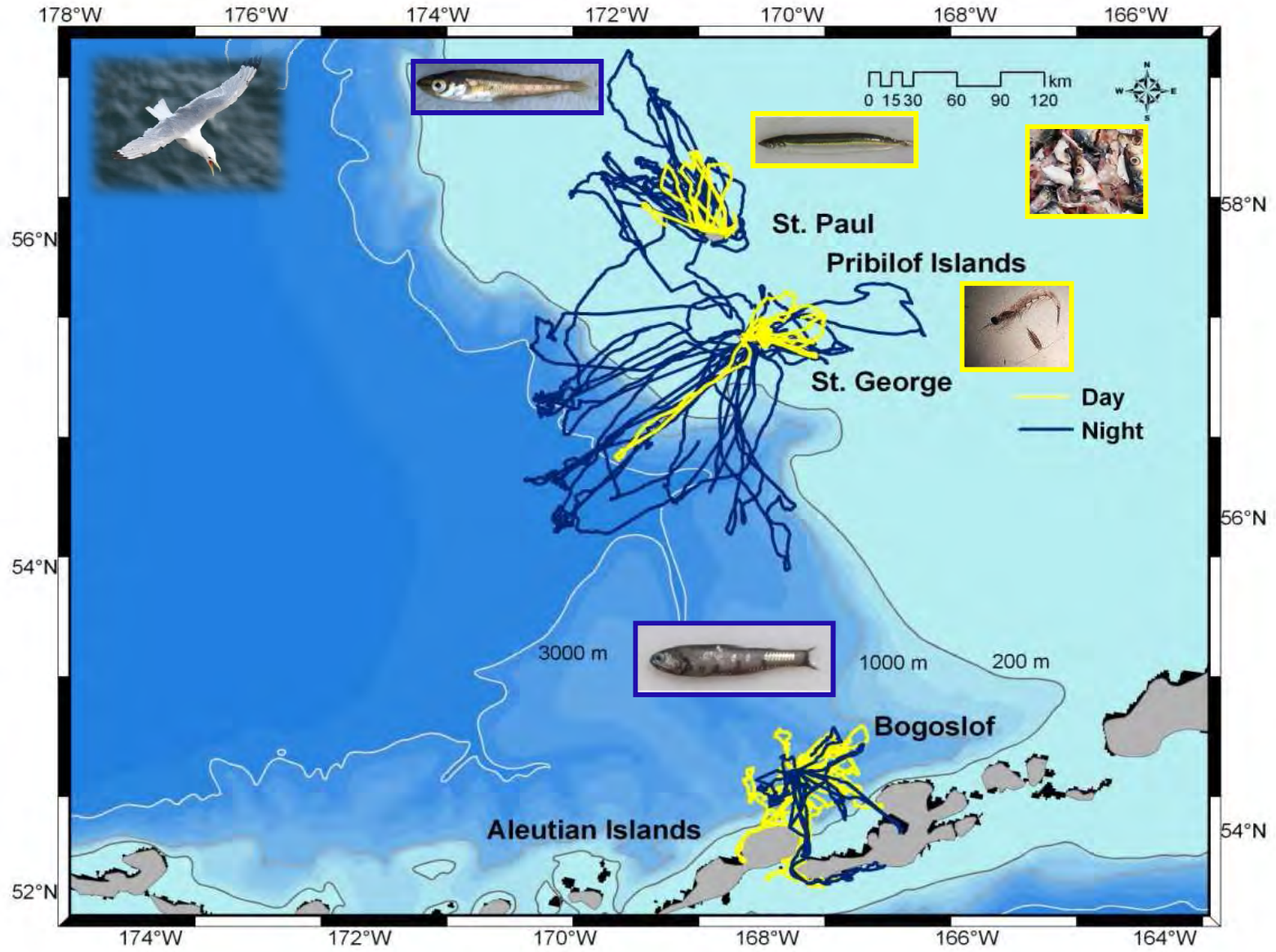
Contrasting day and night foraging trips at shelf colonies



1. Spatial comparison results: ***GPS tracking***

Domain matters? YES

Conclusions

- Low prey availability near shelf colonies resulted in long-distance foraging trips, low chick feeding rates, low chick survival, and low nest success
- Long-distance over-night foraging trips compensated for lack of suitable prey on the Shelf during the day
- Bogoslof kittiwakes (basin) foraged more efficiently than Pribilof kittiwakes (shelf)

Results –Temporal Comparison

Compare the at-sea foraging behavior, breeding performance and diet of black-legged kittiwakes (*Rissa tridactyla*)

1) Spatial – 2009: Pribilofs (shelf) vs. Bogoslof (basin)

Domain matters?

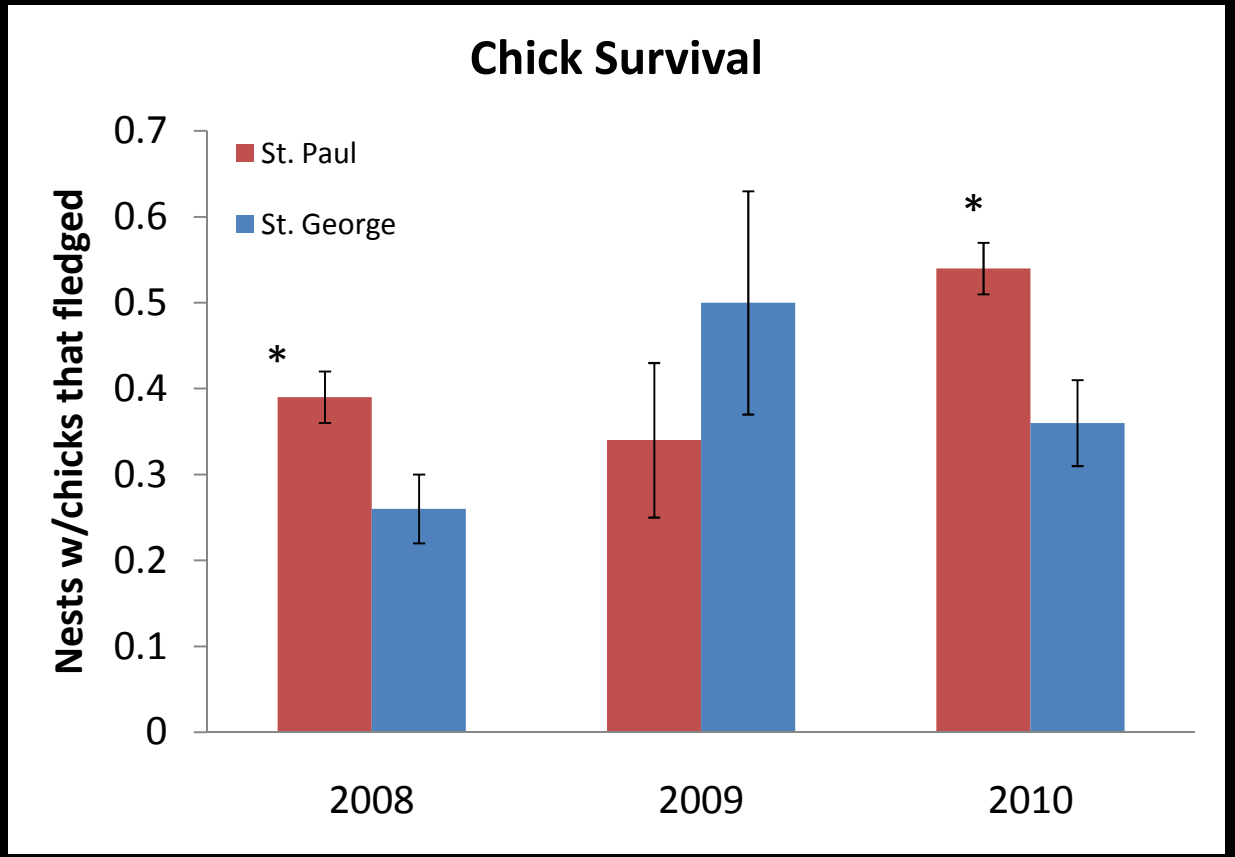
Basin colony will do better than shelf colonies

2) Temporal – 2008 to 2010: Pribilofs

Proximity to Shelf Break matters?

Prediction: St. George will do better than St. Paul

St. George kittiwakes had lower chick survival



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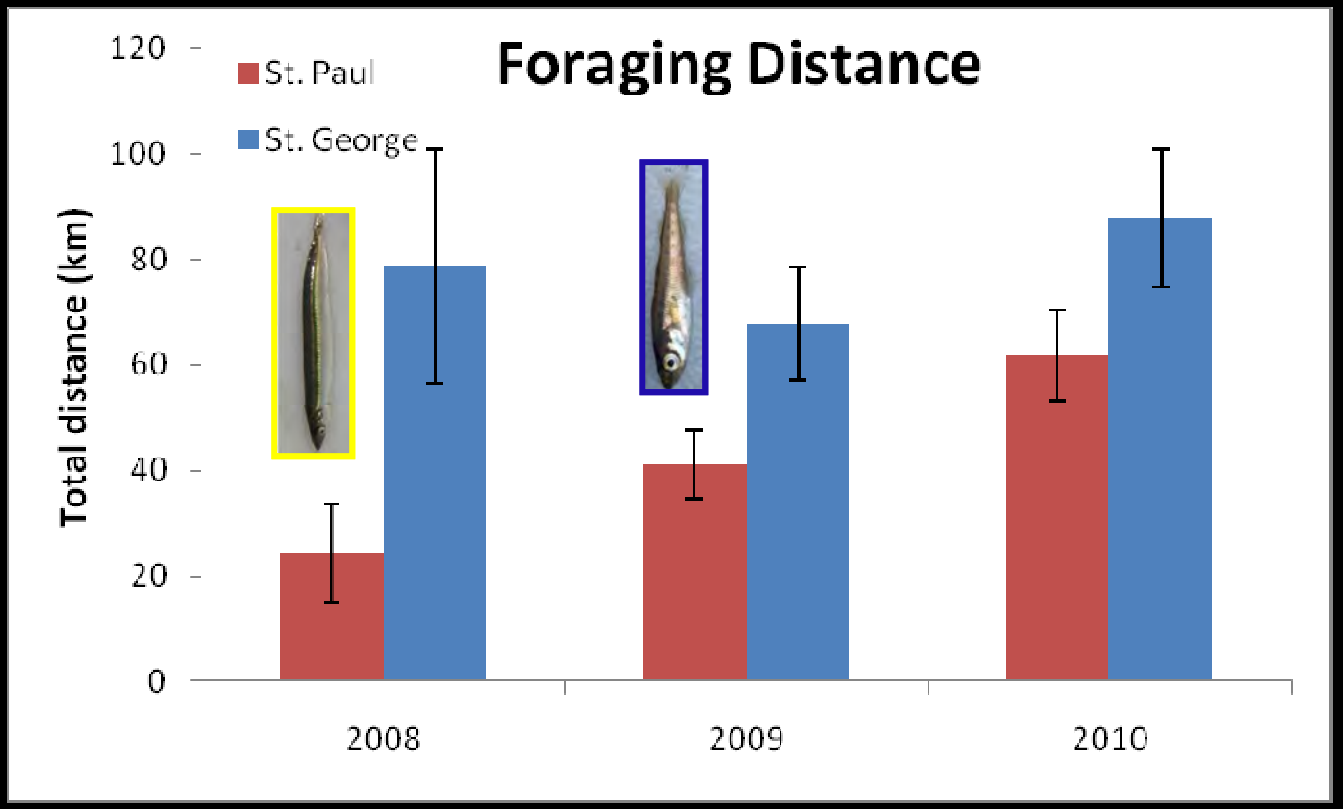
St. George kittiwakes foraged greater distances from colony



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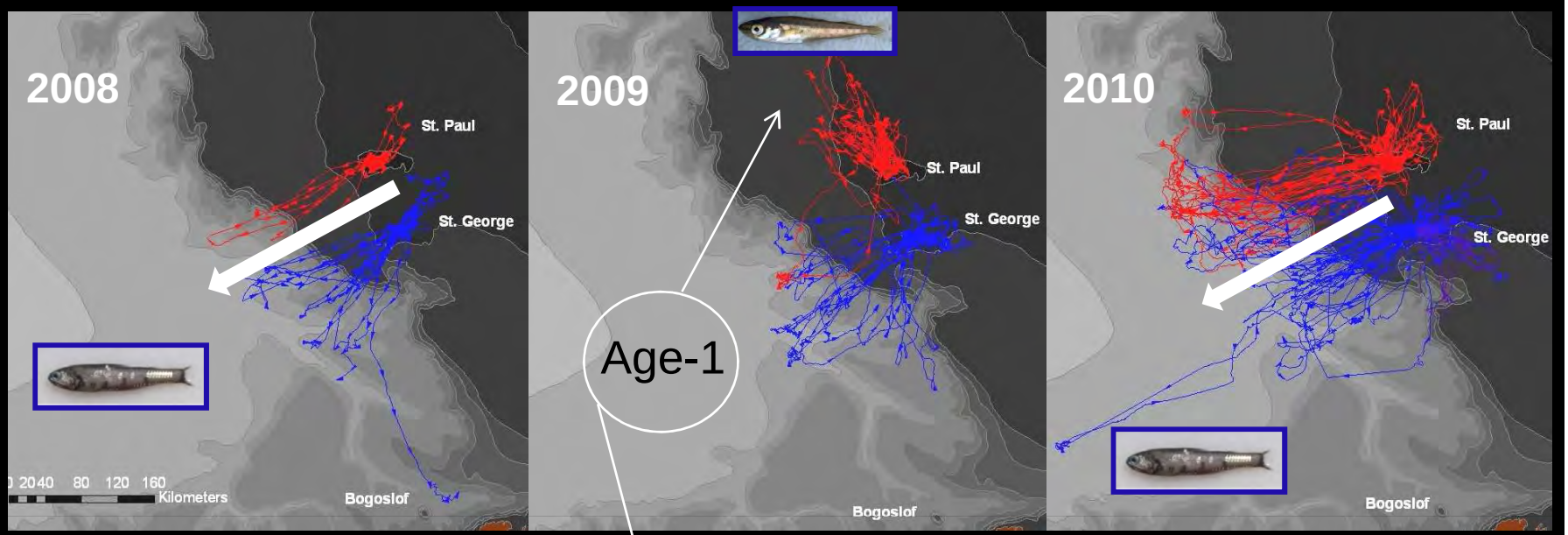
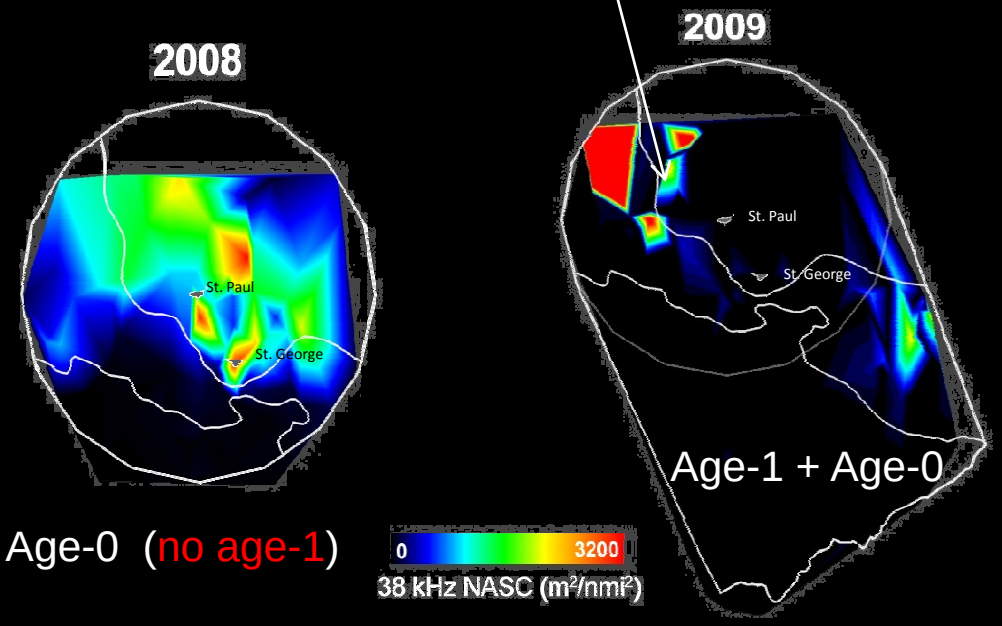
Kittiwakes adjusted over-night foraging behavior in response to shifts in distribution and availability of age-1 pollock





Benoit-Bird and Heppell

Proximity to Shelf Break matters? NO

Conclusions

- St. George kittiwakes had greater foraging range and lower chick survival than St. Paul kittiwakes, despite proximity to Shelf Break
  - St. George kittiwakes did not consume juvenile pollock
- Low availability of juvenile pollock near St. George resulted in consistent foraging over the basin on lanternfish
- St. Paul kittiwakes switched foraging areas and primary prey in response to changes in availability of juvenile pollock

Take Home messages

- Cold ocean conditions on SE Bering Sea Shelf during 2008-2010 associated with low reproductive success of kittiwakes on Pribilofs
- Pribilof kittiwakes adopted long-distance overnight foraging strategy over Aleutian Basin in response to low food availability on Shelf
- Long-distance foraging associated with low chick provisioning rates, high parental stress, and low chick survival
- Availability of forage fish stocks, especially juvenile pollock, on the Bering Sea shelf near the Pribilofs will play an important role in future kittiwake population trends in the SE Bering Sea

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At-colony and at-sea data collection

- Nesting success, feeding frequency, and chick survival – Observations, monitoring
- Stress levels – blood samples
- Diet composition – regurgitations
- Juvenile pollock availability – acoustic surveys

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